APPENDIX A

Federal Agency Questionnaire for Needs in Extreme Precipitation

Preamble: Extreme storm hydrometeorology studies impact extreme flood estimates and assessments for dams, nuclear power plants, levees, and other high-hazard structures within the United States. Additionally, environmental impacts from extreme storm events are of increasing concern. The Extreme Storm Events Work Group is responsible for reviewing and improving methodologies and data collection techniques used to develop design precipitation estimates of large storm events up to and including the Probable Maximum Precipitation. The charter for the Work Group states that it will develop a detailed scope of work/plan of study and determine the necessary funding requirements to update the *Catalog of Extreme Storms* and *Hydrometeorological Reports (HMRs)*. The Work Group is also tasked with developing a list of individual Federal Agency extreme storm product needs. From ongoing discussions and recent advances to probabilistic methodologies for risk-assessment, it is evident that updates to the *Catalog of Extreme Storms* and *Hydrometeorological Reports* may not fully address the national needs. This questionnaire asks each Agency to critically evaluate their views, methods, data sources, tools, etc. regarding extreme storm events and to identify any needs and/or gaps in extreme storm event information. In a Writing Workshop scheduled for later this year, the answers to the questionnaires will be synthesized to define extreme storm product(s) that are needed for deterministic and risk-informed infrastructure design. The product(s) and corresponding schedule(s) and cost(s) will be presented in a proposal to ACWI-SOH.

1. Discuss your agency methods and extreme precipitation needs for decision making, assessments, and designs (extreme precipitation is defined as those events with a return period of 1,000-years or greater, up to and including PMP):
    a. What extreme precipitation data do you use in your decisions?
    b. How is this extreme precipitation data used?
    c. What is the scale and resolution of this data (regional, site-specific, watershed-specific)?
    d. What is the spatial extent to which this data is applied?
    e. Would it be beneficial if this data were updated? And why is that?
    f. What decisions are made by utilizing this data?

2. Describe your agency views on the recommendations and priorities from "Estimating Bounds on Extreme Precipitation Events" NRC 1994 report (pp 19-21), including: http://www.nap.edu/openbook.php?record_id=9195
    a. Continued use of PMP, or alternatives?
    b. Use of Numerical models?
    c. Assessment of radar accuracy?
    d. Estimating probabilities of extreme rainfall?
    e. Storm-based analyses?
    f. Is there a need for a national standard for consistency?

3. Discuss your thoughts and views on the priorities (risk analysis, standards, meteorology) from the "Hydrologic Research Needs for Dam Safety" FEMA workshop USACE 2001 report (pp. 171-176) (also published by FEMA in 2005), including these three from the top 10: http://www.hec.usace.army.mil/publications/SeminarProceedings/SP-29.pdf
    a. Historical database of storms and floods?
    b. Precipitation Analysis needs?
    c. Extend frequencies?

4. Describe what your agency would like to incorporate and support that came out of the Probabilistic Flood Hazard Workshop held at the Nuclear Regulatory Commission in January 2013
   http://www.nrc.gov/reading-rm/doc-collections/nuregs/conference/cp0302/ (pp. 10-4 to 10-7)
    a. Focus on extreme rainfall observations and improve databases
    b. Explore advances in data-processing methods
    c. Develop regionalized techniques
    d. Stochastic methods

5. Discuss applicability of current Federal extreme precipitation publications, databases and tools:
    a. Hydrometeorological Reports
        i. What information do you glean from the HMRs? And how do you use this information exactly?
        ii. Which information is most useful?
        iii. Do you use the spatial and temporal storm patterns provided?
        iv. Do you use the DAD tables?
        v. Do you use the HMRs to compute PMP?
        vi. Do you use the HMRs to compute a percentage of PMP? Which percentage?
        vii. Do you use the areal reduction factors provided in the HMRs?
        viii. Do you consider storm seasonality in your studies?
        ix. Which HMR do you consult the most often?
        x. Are the HMRs easy to use? If not, why?
        xi. Do you use the digitized HMR 51 plates? Or the shapefiles available for HMR 58 and 59?
        xii. What would you change about the HMRs when/if updated?
        xiii. What additional information would you want to see included?
        xiv. Do you use any other studies besides the HMRs for PMP?
        xv. Do you estimate PMP probabilities? If so, how?
    b. NOAA Atlas 14
        i. NOAA Atlas 14 is being updated to include the Northeastern states (from TP40). Funding has not yet been found to update estimates for Texas (from TP40) or the Northwestern states (from NOAA Atlas 2). How important is it to your

organization to have NOAA Atlas 14 volumes for Texas and the Northwestern states?

ii. What information do you glean from NOAA Atlases 2 and 14? And how do you use this information exactly?
iii. Which return period is most useful to your studies?
iv. Do you extrapolate beyond the 1,000-year return period (not recommended by NWS)? If so, how?
v. Which duration(s) is most useful to your studies?
vi. How do you determine your storm duration(s)?
vii. NOAA Atlases 2 and 14 contain point-based precipitation. Do you need areal information?
viii. Do you currently compute areal estimates based on the point values from NOAA Atlas 2 or 14? If so, how? And where/how do you obtain your areal reduction factors if you use that method?
ix. Which region of the United States is of most interest to you for precipitation frequency estimates?
x. Did you use NOAA Atlas 2 or TP40 before NOAA Atlas 14 volumes were published?
xi. Do you still use NOAA Atlas 2 or TP40? Where for? And for what purpose?
xii. To what extent is NOAA Atlas 14 information incorporated into design guidance or regulations that govern what you do?
xiii. Are there elements in NOAA Atlas 2 or TP 40 missing in NOAA Atlas 14?
xiv. Is NOAA Atlas 14 easy to use? How could it be improved?
xv. Do you input latitude/longitude values into the web interface?
xvi. Do you consult the isopluvial maps of precipitation frequency estimates for a particular exceedance probability and duration? If so, what value do they provide beyond the GIS compatible grids of the same information?
xvii. Of what value are the temporal distribution curves in NOAA Atlas 14?
xviii. Of what value are the seasonal curves in NOAA Atlas 14?
xix. There is a difference between precipitation frequency estimates more frequency than about 15-20 years ARI for estimates derived from annual maximum series and estimates derived from annual maximum series and estimates derived from partial duration series. How important is it for NOAA Atlas 14 to provide both? Which of the two is your preference and why?
xx. Do you consult the report documentation of NOAA Atlas 14 for any purpose?
xxi. Do you use any of the background information that the NWS used to compute the precipitation frequency estimates? If so, what exactly? (e.g., gauge data, clusters)

c. National Storm Catalog (USACE big black book of storms)
   i. Do you have a copy of this book?
   ii. What information from this book do you use?

iii. If the book was digitized, would you use the information?
iv. Do you consult DAD tables in your safety analyses?
v. Are storm spatial patterns needed in your safety analyses?

6. What other extreme precipitation resources does your agency utilize?
    a. Non-Federal technical documents on extreme storms or PMP?
    b. Other non-Federal documents?
    c. Data?
    d. Software?

7. Discuss any gaps or further needs
    a. What precipitation/extreme storm information do you need that you don't have now?
    b. For data gaps, what is the most pressing piece of information that needs to be created or updated?

8. Please identify Agency representatives and other attendees willing to participate in the Extreme Storm Events Work Group's Writing Workshop, currently scheduled for May 15-16, 2014, in Washington, D.C., either on-site or remotely via webinar. Please include contact information.